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10/632,823	08/04/2003	Vidya Venkatachalam	115975	9203

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EXAMINER	
BLOOM, NATHAN J	
ART UNIT	**PAPER NUMBER**
2609	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/27/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/632,823	VENKATACHALAM, VIDYA	
	Examiner	Art Unit	
	Nathan Bloom	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01/04/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Section IV.C, reads as follows:

While abstract ideas, natural phenomena, and laws of nature are not eligible for patenting, methods and products employing abstract ideas, natural phenomena, and laws of nature to perform real-world function may well be. In evaluating whether a claim meets the requirements of section 101, the claim must be considered as a whole to determine whether it is for a particular application of an abstract idea, natural phenomenon, or law of nature, rather than for the abstract idea, natural phenomenon, or law of nature itself.

For claims including such excluded subject matter to be eligible, the claim must be for a practical application of the abstract idea, law of nature or natural phenomenon. Diehr, 450 U.S. at 187, 209 USPQ at 8 ("application of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection"); Benson, 409 U.S. at 71, 175 USPQ at 676 (rejecting formula claim because it "has no substantial practical application").

To satisfy section 101 requirements, the claim must be for a practical application of the Sec. 101 judicial exception, which can be identified in various ways:

The claimed invention "transforms" an article or physical object to a different state or thing.

The claimed invention otherwise produces a useful, concrete and tangible result, based on the factors discussed below.

Claims 14-18 and 21-23 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 14-18 and 21-23 recite functional descriptive material on a computer readable medium. However, the program/algorithm itself merely solves a mathematical problem without a limitation to a practical application. A practical application exists if the *result* of the claimed invention is "useful, concrete, and tangible" (with the emphasis on "result")(Guidelines, section IV.C.2.b). A "useful" result is one that satisfies the utility requirement of section 101, a "concrete" result is one that is "repeatable" or "predictable", and a "tangible" result is one that is "real", or "real-world", as opposed to "abstract" (Guidelines, section IV.C.2.b). Claims 14-18 and 21-23 merely manipulate data without ever producing a useful, concrete, and tangible result. Claims 14-18 and 21-23 describe the functional descriptive material as depicted in the flow chart of figure 4 and the result of this process is the storing of a program (abstract idea) that is produced by these steps. The storing of a program (abstract idea) is not a useful, concrete, and tangible result.

Claims 1-13 and 19-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 1-13 and 19-20 recite the mere manipulation of data or an abstract idea, or merely solves mathematical problem without a limitation to a practical application. A practical application exists if the *result* of the claimed invention is "useful, concrete, and tangible" (with the emphasis on "result")(Guidelines, section IV.C.2.b). A "useful" result is one that satisfies the utility requirement of section 101, a "concrete" result is one that is "repeatable" or "predictable", and a "tangible" result is one that is "real", or "real-

world", as opposed to "abstract" (Guidelines, section IV.C.2.b). Claims 1-13 and 19-20 merely manipulate data without ever producing a useful, concrete, and tangible result. The result of the claimed methods is the determination of the lines and the mere determination of lines is not a "useful, concrete, and tangible" result.

In order for the claimed method to produce a "useful, concrete, and tangible" result, recitation of one or more of the following is suggested:

- The manipulation of data that represents a physical object or activity transformed from outside the computer.
- A physical transformation outside the computer, for example in the form of pre or post computer processing activity.
- A direct recitation of a practical application.

Applicant is also advised to provide a written explanation of how and why the claimed invention (either as currently recited or as amended) produces a "useful, concrete, and tangible" result.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. , Claims 1-5, 12-13, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doudkin et al in further view of Lambert (both submitted by applicant in an IDS).

Instant claim 1 encompasses a method for operating an inspection system to inspect a work-piece having a highly textured or low contrast surface. This method is comprised of the following steps: capture image of work-piece, enhance characteristics of at least one of the lines to be determined, transform the enhanced image to generate a 2-D set of values that include local extrema corresponding to probable individual lines, determine the at least one line to be determined based on the 2-D set of values and the previously defined line constraints corresponding to the work-piece. Doudkin discloses a method for object identification using a computer inspection system. In section 2 on pages 1-3 of the article Doudkin discloses the taking of a picture of a circuit then enhancing the picture by filtering to eliminate noise and then correcting the contrast (histogram) of the image. These circuit boards typically have a lot of components densely packed on the surface creating a highly textured surface where it can be difficult to discern the components from one another and thus it becomes necessary to enhance the contrast between these devices and their background. The image is then further enhanced by thresholding, which produces a binary image. Then in section 3 of the article on pages 3-4 the image is transformed using a Hough transform that transforms the line information from the X-Y domain to points in the parametric (Hough) space, that identifies straight lines within the enhanced image as extrema in the parametric (Hough) space. However, Doudkin does not teach the further identification of lines by matching them with known constraints characteristic of the particular work-piece. Lambert teaches a vision inspection system that detects the lines of a work-piece using a Hough transform and further selects the at least one line to be determined

based on the following known constraints of the work-piece: the number of lines (layers), the minimum distance between the lines. Lambert on page 3 section C teaches that the layers are layers of food packing films which are checked for correct thickness using the machine vision inspection system, but first these lines must be detected using the Hough transform which transforms lines from the image domain to peaks in the parametric domain. Once all lines are identified they are limited to those that are relevant by using the number of lines, the minimum thickness, and it is not stated but it is understood by one of ordinary skill in the art that the fact that these lines will be approximately parallel is a factor in the determination of the lines. It would have been obvious to one of ordinary skill in the art to combine the teachings of Lambert and Doudkin to increase accuracy of the line detection by removing irrelevant line information by using known constraints of the work-piece.

Instant claim 2 further limits the method of instant claim 1 wherein determining the at least one line to be determined comprises applying the line constraint to restrict a selection of at least one of a selected set of local extrema in the 2-D set or a set of the at least one line to be determined. Instant claim 3 further limits the method of instant claim 2 wherein the previously defined line constraint comprises at least of a number of lines to be determined or a geological relationship constraint of the at least one line to be determined. Also, instant claim 5 further limits the method of claim 3 wherein the geometric relationship comprises line spacing. As per rejection of instant claim 1 it has been disclosed by Lambert in section C on page 3. In particular, Lambert states that the minimum known distance (geometric relationship constraint) between the lines induces a restriction of minimum distance between peaks of the Hough parametric space, and the number of peaks (lines to be determined) is used as a constraint.

Instant claim 4 further limits the method of claim 3 wherein the geometric relationship constraint comprises an angular orientation constraint comprising at least of the following: angular orientation of one of the lines to be determined with a line-like feature or another line to be determined, the lines to be determined are approximately parallel to one another, or between the at least one line to be determined and a coordinate reference frame. As per rejection of instant claim 1 it would have been obvious to one of ordinary skill in the art that one of the characteristics of the lines to be determined in Lambert are that the lines to be determined need to be approximately parallel. This would have been obvious to one of ordinary skill in the art since a characteristic of the layer of film is that it has two opposing sides that are approximately parallel.

Instant claim 12 further limits the method of claim 1 wherein enhancing the characteristics of the image comprises at least one of the following: performing expansion on at least some of the pixels of the image that correspond to the at least one characteristic, or performing at least one operation that tends to increase the contrast between pixels corresponding to the at least one line and the background. As per rejection of instant claim 1 Lambert and Doudkin teach the enhancement of the image by increasing the contrast through filtering, histogram correction, and thresholding of the image to create a binary image (high contrast). Furthermore, Doudkin also teaches thresholding of the image features to increase contrast.

Instant claim 13 further limits the method of claim 1 wherein the at least one enhanced characteristic is the line width, improved continuity, or increase in a difference between the average pixel intensity of the pixels representing the line and those representing the background.

As per rejection of instant claims 1 and 12 this has been disclosed by Lambert in combination with Doudkin. Lambert performs thresholding on the image that turns the image into a binary representation of the former image wherein what represents the lines is a 1 and what is not the line (or feature) is a zero.

Instant claim 19 encompasses the method of claim 1 with the further limitation that there are at least two lines to be determined. Since Lambert teaches the detection of lines of the film layers and there will be at least one layer that will have 2 lines to be determined then this limitation has been disclosed by Lambert. Furthermore, instant claim 20 further limits the method of claim 19 and provides the enhancement limitations as described by instant claim 13. As per the rejection of instant claim 13 and 1 Doudkin in combination with Lambert has disclosed these limitations in combination.

3. Claims 1, 6-11, 14-18, and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doudkin in view of Lambert and in further view of Song ("A New Approach for Line Recognition in Large-size Images Using Hough Transform").

Instant claim 6 further limits the method of claim 3 wherein the selection of at least a selected set or selected preliminary set of at least one 2-D local extrema comprises selecting at least one most extreme valued proper-polarity extrema in a selected region of the 2-D set of value as the set members. The selection of the at least one most extreme valued proper-polarity in a selected region is not disclosed in Doudkin or Lambert, but Song discloses the use of the Hough transform for line recognition and further elaborates on the selecting of values greater than a particular threshold. Song teaches a method of using a new approach to the Hough

transform for line recognition and given that Doudkin and Lambert teach the application of Hough transform then it would have been obvious to one of ordinary skill in the art to implement the advantages of Song's teachings. Song discloses in sections 2.1 and 2.2 the use of locating local maxima within a given neighborhood and performing this iteratively over the transformed image. Therefore, it is obvious to one of ordinary skill in the art that at lèast one most extreme value will be accorded for a selected region.

Instant claim 7 further limits the method of claim 6 wherein the selection of claim 6 is further limited to those extremum that also correspond to the conditions of at least one line constraint. Limiting the extremum to those that correspond to certain line constraints has been disclosed by Lambert as was shown in rejection of instant claims 1-5. Furthermore, Song limits the selection of extremum by line size, gap, and width in sections 2 through 2.2.

Instant claim 8 further limits the method of claim 6 wherein the selection of claim 6 is further limited to those extremum. Limiting the number of lines and hence set members by quantity has been disclosed by Lambert as was previously shown in the rejection of instant claims 1 and 2.

Instant claim 9 further limits the method of claim 6 wherein the selection region of claim 6 is either the entire 2-D set of values or a restricted set of the 2-D values based on at least one line constraint. Neither Lambert nor Doudkin requires the limiting of the region thus the entire two-dimensional set is selected. However, Song in sections 1 and 2 refers to selecting particular neighborhoods or sub-images and then selecting peaks in these based on constraints such as length and width.

Instant claim 10 further limits the method of claim 9 wherein the restricted portion of the 2-D set of values is determined based at least partially on at least one line constraint corresponds to the approximate vicinity of a one-dimensional proper-polarity global extremum of the 2-D set of values. Instant claim 11 further limits the method of claim 10 wherein the one-dimensional proper polarity global extremum of the 2-D set of values corresponds to a plurality of local extrema that have an angular orientation coordinate that is at least approximately the same for each of the plurality of local extrema. It was known to one of ordinary skill in the art that a one-dimensional extremum as described by applicant corresponds to a set of approximately parallel lines. Given that in Lambert it has been disclosed that the lines of the packaging film are approximately parallel lines then it would have been obvious to one of ordinary skill that the region of interest of the 2-D set is limited to within this area based on the parallel line constraints of the food film. Any lines not approximately parallel and not within a particular distance from the line are not considered hence the region of interest is being limited at least partially by the 1-D extremum.

Instant claims 14-18 and 21-23 encompass the method for programming a machine vision inspection system that performs the operations as described by instant claim 1-13 and 19-20. Since these computer vision systems have been developed and implanted in software it is understood to one of ordinary skill in the art that the process of developing these programs has been accomplished. Therefore as per rejection of instant claims 1-13 and 19-20 Lambert, Doudkin, and Song have disclosed the method of operating the machine vision inspection system and the programs that they operate on.

In particular instant claims 14, 21, and 23 are the method for programming a machine vision inspection system that performs the operations as described in instant claim 1.

Instant claims 15 and 22 further limit the method of claims 14 and 21 and have been encompassed by the rejection of instant claims 12 and 13. It is obvious to one of ordinary skill in the art that the processes for enhancing were selected and the parameters adjusted appropriately for the given system. In fact on page 4 of Lambert is shown the results of various parameters used in the enhancement process. Also, methods used such as the corrective histogram, thresholding, filtering and smoothing operations described in Doudkin often times take several iterations to develop an optimal set of enhancements for the particular work-piece. This is understood in the art and is part of the reason exact values are not given in the art is because they vary by situation. Furthermore, instant claim 16 further limits the method of claim 15 and has been encompassed by the rejection of instant claims 12-13, and 15.

Instant claim 17 further limits the method of claim 14 wherein the determining technique has been previously determined and is governable by the selection of one or parameters. By Lambert and Doudkin it is known that the identification of the lines to be determined (by a model or drawing) is a necessary step for feature or line matching. Furthermore, Song then teaches the adjustment of line parameters such as the lengths and widths of lines in section 2 of the paper. Therefore, it would have been obvious to one of ordinary skill in the art that in the development of the program that such parameters were considered in the determination of the lines. Also, instant claim 18 further limits the claim of method 15 wherein the parameters are determined by iteratively selecting and observing the results. These programs have already been constructed using the proper parameters, and it is understood by one of ordinary skill in the art

that the correct parameters need to be selected in order to achieve proper performance form the machine vision inspection system.

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Bahlmann ("Artificial Neural Networks for Automated Quality Control of Textile Seams") discloses the inspection of textiles wherein the seam is located and the quality is determined based on stored quality models.

Chin ("Model Based Recognition in Robot Vision") discloses a machine vision system wherein objects are recognized based on known data for learned models. The models can be 2-D, 21/2-D, or 3-D models and the data stored about them are based on the recognition technique used whether it is a global, local, or relational technique.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan Bloom whose telephone number is 571-272-9321. The examiner can normally be reached on Monday through Thursday from 7:30 am to 5:00 pm (EST). The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Stucker, can be reached on 571-272-0911. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nathan Bloom 2/29/2007

JEFFREY STUCKER
SUPERVISORY PATENT EXAMINER